N91-25469

34-43
20137

Title: **The Advanced Microwave Precipitation Radiometer: A New Aircraft Radiometer for Passive Precipitation Remote Sensing**

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Discipline: **Atmosphere**

Past studies of passive microwave measurements of precipitating systems have yielded broad empirical relationships between hydrometeors and microwave transmission. In general, these relationships fall into two categories of passive microwave precipitation retrievals. A radiometer measures radiances emitted in the microwave by the Earth's surface and atmosphere. These radiances can be in turn converted to brightness temperatures. Emission-based methods of precipitation retrievals rely upon the observed effect of liquid precipitation to increase the brightness temperature of a radiometrically cold background such as an ocean surface. A scattering-based method is based upon the effect that frozen hydrometeors tend to decrease the brightness temperature of a radiometrically warm background such as land.

One step toward developing quantitative brightness temperature-rain rate relationships is the recent construction of a new aircraft instrument sponsored by National Aeronautics and Space Administration/Marshall Space Flight Center (NASA/MSFC). This instrument is the Advanced Microwave Precipitation Radiometer (AMPR) designed and built by Georgia Tech Research Institute to fly aboard high altitude research aircraft such as the NASA ER-2. The AMPR and its accompanying data acquisition system are mounted in the Q-bay compartment of the NASA ER-2.

AMPR is a cross-track scanning microwave radiometer with a unique combination of four total power channels centered at 10.7, 19.35, 37.1, and 85.5 GHz. It has a dual lens antenna to accommodate two separate feedhorns. One horn is a copy of the Special Sensor Microwave/Imager spaceborne multi-frequency feedhorn designed and built by Microwave Engineering Corporation. This horn feeds the 19.35, 37.1, and 85.5 GHz channels while the other AMPR feedhorn is for the 10.7 GHz channel. The sum of the two lenses of the dual antenna is less than 15 inches which is the maximum the ER-2 hatch opening could accommodate. Other design features of the AMPR system include surface resolutions of the nadir-viewing footprints ranging in size from 2.8 km for the 10.7 and 19.35 GHz channels down to 0.64 km at 85.5 GHz. All channels achieve a minimum sampling temperature resolution of less than 0.5^{o}C.

The wide range of channel frequencies the AMPR possesses will be extremely useful in future field studies of precipitating systems. Further understanding of the vertical structure of thunderstorms should be gained since the higher frequency measurements such as 85.5 GHz tend to be greatly affected by ice particles above the freezing level while lower frequency data such at 10.7 GHz exhibit a greater influence by liquid hydrometeors below the freezing level. Other research topics of special interest include the quantitative correlation of brightness temperature and rain rate over the entire rain rate range, over the life cycle of a precipitation system, and between precipitation systems in differing atmospheric environments.